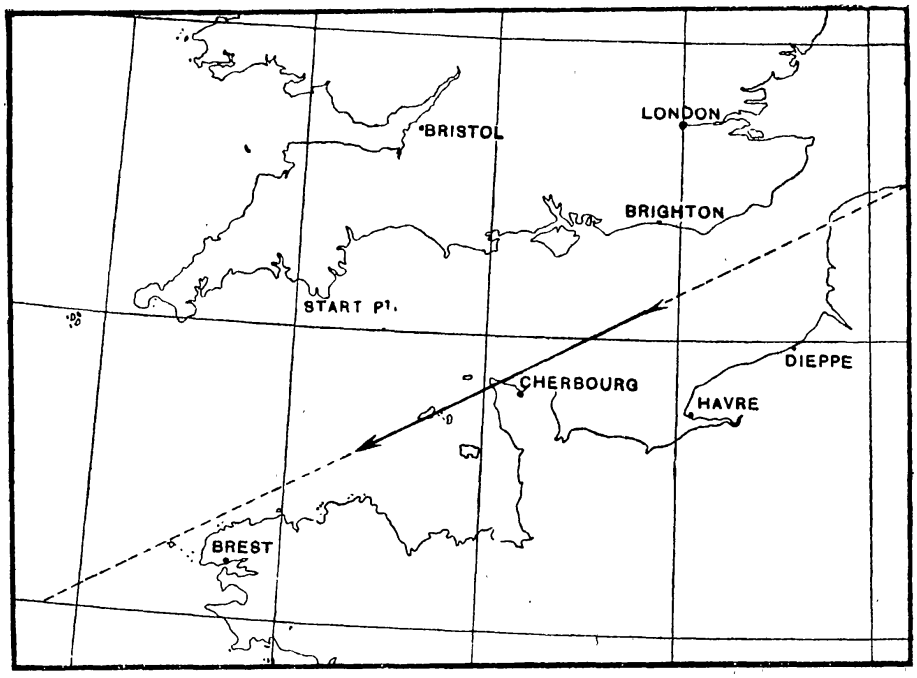
The Fireball of 1909 *February* 22, 7^h 33^m.

By W. F. Denning.

I have compared the numerous observations of the fireball of February 22 and find that the radiant point best satisfying the observed paths was at $190° + 20°$, about 14° E.N.E. of the star β Leonis. This implies that the object had a direction of flight from E.N.E. to W.S.W

It is usually found that a miscellaneous collection of descriptions such as those recently sent in are far from being accordant, but in



Fireball of 1909 Feb. 22. Path over English Channel.

the present case many of them are in fair agreement, and prove that amateur astronomers are not only increasing in numbers, but that they fully recognise the necessity of recording celestial events with the greatest fulness and accuracy possible.

Further observations from the French coast and the Channel Islands would be of considerable use as affording a means of testing the exactness of the deductions already made. The meteor gave a magnificent display over the region of Cherbourg, Jersey, and Guernsey, and appears to have illuminated the heavens with more vivid effect than that of full-moon light.

1909 *February* 22.

Brightness $\frac{1}{2}$ to > full moon over English Channel and Channel Islands.
Radiant 190° + 20°.

Height at first	56 miles	40 m. S. of Brighton.
Height at end	41 miles	65 m. S S.E. Start Point.
Length of path	155 miles	E.N.E. to S.S.W.
Velocity per second	25 miles	
Number of observations	122	
Name of meteor	Coma Berenicid	
Duration of streak	3 hours	
Velocity of drift per hour	80 to 100 miles.	S.E. to N.W.
Greatest arc observed	120° 8.20 p.m.	
Length with angles and reversals	180° ,,	
Real length	> 150 miles	

One singular feature connected with the object was that during its flight the blue nucleus threw off a short trail of red sparks, and that these immediately died away, giving place to the long streak of phosphorescence, which apparently developed in length and lost none of its intensity during the 50 minutes up to $8^h\ 20^m$.

It is interesting to compare the period of duration of the streak as estimated by various persons. The following are the intervals given by many of the best observers:—

Duration.	Observers.	Duration.	Observers.
30 mins.	4	100 mins.	3
45 ,,	6	105 ,,	10
60 ,,	8	110 ,,	4
70 ,,	4	120 ,,	6
75 ,,	3	135 to 180 ,,	4
90 ,,	6		

It is difficult to obtain the rate at which the streak drifted, for the whole of it does not appear to have been affected in equal degree, and there are differences in the drawings even by observers at the same place. Moreover, it is not easy to identify the same part of the streak at various periods, except perhaps the bend at the extremities. As observed from the south coast of England (Hants and Dorset), the phosphorescent band moved from the region of Hydra, Monoceros, Canis Minor, and Orion, to Ursa Minor, Cassiopeia, and the more westerly constellations, being finally lost amid the galaxy and zodiacal light. At first it appeared as a narrow ribbon of light about $\frac{1}{3}$ of a degree wide, but this broadened while its brightness decreased, and it was some $2\frac{1}{2}$ degrees wide just prior to disappearance. The direction of the drift was to N.W. (agreeing approximately with the light wind current at the time), and the average velocity was at least 80 miles per hour.

Upon its first appearance the streak was probably about half a mile in breadth, but it expanded to more than three or four

miles before becoming invisible. But it was not of equal width in all sections, and of course its extent varied according to the distance of observers.

A radiant point in Coma Berenices agreeing with that from which the fireball was directed has been observed in February, March, and April, but the shower has never exhibited any notable activity, or shown a capacity to furnish fireballs of brilliant or unusual type. It is often the case, however, that a meteor of great magnificence is directed from the radiant of a stream of ordinary shooting stars. As an instance, I may mention that in 1908 July I observed 12 small shooting stars from a centre at $302^\circ + 22^\circ$, and that there was one splendid fireball, which gave a flash as it fell far brighter than the light of a full moon directed from the same point! Certain large meteors appear to be isolated; at any rate no ordinary meteoric showers can be recognised simultaneously with their appearance, and possibly it may be only chance coincidences in position which bring certain fireballs into touch with the radiants of small shooting stars. But in the case of showers like the Perseids and Leonids, the largest fireballs seem to be blended with the faintest class of telescopic meteors.

During the last ten years the month of January appears to have furnished us with many more fireballs than February, but this only applies to results obtained in the United Kingdom. Two fine meteors, which were sufficiently well observed for their real paths to be computed, were recorded in 1909 January 11 and 25, and some particulars concerning them are appended. In February, I have sometimes noticed large meteors from a radiant near α Aurigæ ($75^\circ + 41^\circ$), and both in February and March several radiants near π, τ, and β Leonis are productive of slow-moving fireballs. But these showers display no unusual features. The meteor of February 22 must have been of exceptional kind to have evolved a gaseous residue maintaining phosphorescence during two or three hours, and even at the expiration of that interval it appears to have become invisible rather by dispersion than actual extinction.

	Jan. 11.	Jan. 25.
Date and G.M.T.	$8^h\ 11^m$	$13^h\ 25^m$.
Brightness	$> ♀$	$> ♀$.
Height at first	58 miles	55 miles.
Height at end	29 ,,	42 ,,
Length of path	52 ,,	108 ,,
Velocity per second	13 ,,	16 ,,
Radiant	$332^\circ + 36^\circ$	$40^\circ + 18^\circ$.
Direction of meteor's flight	N.W. to S.E.	W. to E.
Name of meteor	π Pegasid	ϵ Arietid.
Position	Llandovery to Usk, S. Wales	Uppingham to Lowestoft.

Addendum, April 23.—A large number of interesting observations of the fireball of February 22 have been published in the

Bulletin de la Société Astronomique de France for 1909 April. Some of these are merely indefinite descriptions, others contain useful records of the apparent path and of the successive positions taken up by the long-enduring streak, but it is not easy in all cases to understand whether the meteor flight or streak is alluded to. The French accounts decidedly indicate a greater height at the end and a more horizontal course than that derived from the English observations. Combining the data from both sides of the Channel, they apparently favour a radiant at 196° + 20°, and a height of 56 to 50 miles, the end place being nearly over the Point du Sillon, France, and about 85 miles S.S.E. of Start Point, Devon. The length of observed course and velocity are the same as stated in the summary.

Errata in Mr. Fotheringham's Paper on Regnal Years in the Elephantine Papyri.

Page 447, line 14, *for* Tissaphanes *read* Tissaphernes.
Page 447, line 33 , *after* Nisan *insert* following the accession.
Page 447, line 35, *for* Arab-samma *read* Araḫ-samna.
Page 448, line 19, *for* before *read* after.
Page 448, line 37, *for* preceding *read* following.